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Water-repellent film for leather, contains inorganic microparticle with processed surface, hydrolysis condensate of silicone modified resin and/or silane compound, and specific metal alkoxide

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NOVELTY

A water-repellent film contains inorganic microparticle with hydrophobically processed surface, hydrolysis condensate of silicone modified resin and/or silane compound, and metal alkoxide. The metal alkoxide is substituted and/or coordinated with organic group and/or its hydrolysis condensate, or other component.

DETAILED DESCRIPTION

INDEPENDENT CLAIMS are included for the following:

(1) coating liquid which contains inorganic microparticle with hydrophobically processed surface, hydrolysis condensate of silicone modified resin and/or silane compound, and metal alkoxide. The metal alkoxide is substituted and/or coordinated with organic group and/or its hydrolysis condensate, or other component; and

(2) manufacture of the water-repellent film which involves providing the coating liquid on a substrate.

USE

For heat exchanger, leather, fiber, paper, cardboard, corrugated board for frozen food, styrene foam, building material, roof, window glass, windshield glass, mirror, plastic lens, tire, magnetic recording medium and semiconductor material surface.

ADVANTAGE

The water-repellent film has excellent weather resistance, adhesion, hardness, stain resistance, accretion-of-prevention property and antiwear quality. The coating liquid has excellent low temperature film-forming property. The water-repellent film is formed easily and inexpensively.

EXAMPLE

RX300 (hydrophobic silica particle) (in wt.%) (50), YC5920

(acryl silicone resin) (49.5) and titanium solution (0.5) were blended to obtain a coating liquid. The obtained coating liquid was applied on a plate and dried at 150°C for 1 hour. The formed coated film had excellent water repellent property and pencil hardness of 1H measured according to JIS K 5400-1900 8.4.

TECHNOLOGY FOCUS

Inorganic Chemistry - Preferred Microparticle: The inorganic microparticle is an oxide of silicon, aluminum, titanium or zirconium. The film contains 40-70 wt.% of inorganic microparticle and 0.5-40 wt.% of metal alkoxide. The metal in the metal alkoxide is chosen from aluminum, zirconium and titanium.

Organic Chemistry - Preferred Compound: The inorganic microparticle is processed using silyl compound chosen from trialkyl silyl compound, dialkyl silyl compound and perfluoroalkyl silyl compound. The silane compound is of formula $R^1_nSiX_{n1}(R^2)_{4-n-n1}$.

X = halogen atom;

R^1 = 1-20C alkyl group or 6-13C aryl group;

R^2 = OR^3, SR^3 or NR^3R^4;

R^3, R^4 = H, 1-20C alkyl group, 6-13C aryl group or acyl group;

n = 0, 1 or 2;

n1 = 0 or 1-4; and

n+n1 = 4 or less.

The organic group is chosen from β-diketone or β-keto ester of formula: $R^4COCH_2COR^5$, and carboxylic acid of formula: R^6CO_2H.

R^4,R^5 = 1-6C alkyl group optionally substituted with halogen atom or 1-6C alkoxy group, R^4 and R^5 are not simultaneously alkoxy group; and

R^6 = 1-6C alkyl group substituted with halogen atom.

The metal alkoxide substituted and/or coordinated with organic group, has formula: $M(OR^7)_m(R^4COCHCOR^5)_{k-m}$.

M = aluminum, zirconium or titanium;

R^7 = 1-6C alkyl group;

R^4,R^5 = same as above;

k = valence of M; and

m = 0 or 1-k.

Polymers - Preferred Property: The water droplet on the coating film has contact angle of 130° or more and sliding down angle of 5° or less. Preferred Resin: The silicone modified resin is silyl group-containing vinyl resin having silicon atom coupled to hydrolyzable group and/or hydrolyzable group at the terminal or in the side chain, and/or its hydrolysis condensate, preferably silyl group-containing vinyl type resin containing fluorine substituted alkyl group.